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Process for the preparation of dehydrated compressed foodstuffs starting from freeze-dried and/or dried, vegetal and/or animal origin products and foodstuffs so obtained.

- A process for the production of compressed dehydrated foodstuffs, said process being characterized in that it comprises the steps of :
- metering the freeze-dried and/or dried, vegetal and/or animal origin products at the doses required for obtaining the final product desired ;
 - dampening the starting products by means of a water/alcohol solution or by means of just alcohol, and/or keeping them at a temperature between 20°C and 95°C for 1 second - 10 minutes, till obtaining the desired plasticity, and possibly :
 - adding in the case of some products a foodstuffs-type thickening compound dissolved in a water/alcohol solution or just in alcohol, the amount added being such that the weight of the solution represents 1-6 % of the finished product ;
 - compressing the product(s) at a pressure between 2 and 100 kg/cm² and at a temperature between 20°C and 95°C for a time in the range between 1 second and 10 seconds ; and
 - packaging the product so obtained with a high-barrier material ;
- the final product being required to have anyway a water activity value (WA) less than or equal to 0.4-0.5 ; as well as the products obtained directly by means of said process.

This invention relates to a process for the production of dried compressed foodstuffs from freeze-dried and/or dried vegetal and/or animal origin products, and the to the foodstuffs so obtained.

A number of patents have been filed more or less recently which are concerned with processes for obtaining compressed foodstuffs.

5 For the most part of them, processes were dealt with by which single products were mainly obtained, in which the starting product having quite a low dampness degree, between 1 and 5 %, was dampened again up to a dampness of a definitely higher value, and hence to such a plasticization of the product that the same could be compressed under quite high pressure values.

10 The following US patents can be mentioned among such patents: No. 3,385,715 (Ishler et al.), No. 3,806,610 (Rahman), No. 3,882,253 (Schafer), No. 3,950,560 (Rahman) No. 4,096,283 (Rahman) and No. 4,109,026 (Rahman).

The re-dampening of the product was carried out by means of water for each one of them.

15 After the compression stage, the drying of the final compressed product was necessary in order to reduce the residual dampness down to a value corresponding to a water activity (WA) below an acceptable value for a long term conservation product.

Water activity represents the ratio of water vapor pressure in the substrate under examination to the pure water vapor pressure under the same conditions. The measurement is carried out at 25°C.

Accordingly, such parameter represents a measure of free water in the product, i.e., the amount of water which is available for promoting the microbial development, enzymic activity, and so on.

20 The present Applicant also filed the Italian Patent No. 1,219,823, wherein a process for the production of compressed foodstuffs is described, said process providing for both the re-dampening stage of the product, as a single product or as a mixture, and the final dehydration stage.

Now it is quite evident that such industrial process, wherein the product undergoing the process is first to be plasticized so that it can undergo compression and then it is to be again taken to final dampness conditions similar to the starting conditions, turns out to be very lengthy and costly.

25 Indeed, in addition to the many working stages to be provided for, resulting in the production times becoming very long, this process calls for the employment of very costly apparatus, especially as regards the final dehydration stage.

30 On the other hand, the plasticization stage of the starting product cannot be avoided, if a good result is desired in the compression stage, nor can a final product with too high a dampness cannot be accepted, if a product is desired which can be commercially distributed and which can be stored for a long time.

35 In that situation, the Applicant has investigated a process for the production of compressed foodstuffs, which process can reconcile both said requirements, i.e. the requirement of having a product of the necessary plasticity features in the compression stage, and the requirement of obtaining, at the end of compression, a product which can be directly packaged without subjecting the same necessarily to a dehydration stage.

These and other results are obtained, according to the present invention, by treating the product with a water-alcohol mixture or by means of alcohol and/or keeping the product itself at a given temperature, so as to realize anyway the plasticization of the product without surpassing the water percentage present that would call for a final dehydration.

40 Again according to this invention, the suggestion is put forward of inserting a given amount of a powder seasoning into the package of the compressed product, said seasoning, in addition to supplying a complete product, also absorbs any possible excess dampness.

Accordingly, it is a specific object of this invention a process for the production of dehydrated compressed foodstuffs, said process being characterized in that it comprises the steps of:

- 45 a) metering the freeze-dried and/or dried, vegetal and/or animal origin products at the doses required for obtaining the desired final product;
 b) plasticizing the starting products by means of a water/alcohol solution or by means of just alcohol and/or through heating at a temperature between 20°C and 95°C for 1 second up to 10 minutes, till the desired degree of plasticity is obtained;
 50 c) compressing the product(s) at a pressure between 2 and 100 kg/cm², at a temperature in the range from 20°C to 95°C and for a time between 1 and 10 seconds; and
 d) packaging the product so obtained with a high-barrier material;

the final product is to contain in any case a water activity (WA) less then or equal to 0.4-0.5.

55 According to the preferred embodiment of the process of the present invention, the following step b1) is performed after the step b):

b1) a thickening, foodstuff-type compound is added, said compound being dissolved in a water/alcohol solution or just in alcohol, the addition being performed in such an amount that the solution weight represents a percentage between 1 % and 6% of the finished product.

According to a particularly preferred embodiment of the process of this invention, if freeze-dried or dried vegetal and/or animal products are employed, the plasticization step b) is carried out only on the freeze-dried products, whereas the dried products are conveyed directly to the step b1) for the addition of the thickening agent together with some freeze-dried products coming from the step b) which as a consequence of their own nature, require the presence of a thickening agent.

During the packaging step d), in the case of mixtures of freeze-dried and/or dried products the seasoning powders are added as such and/or dried, anyway with a water activity less than or equal to 0.3.

The plasticization step b) is carried out preferably through nebulization, employing a water/alcohol mixture in proportions variable between 1 % water-99 % alcohol and 99 % water-1 % alcohol, and in particular with a solution of 20-30 % water/70-80 % alcohol.

As already mentioned above, the step b) can also be carried out completely in alcohol or keeping the products at a certain temperature, preferably at 85°C.

Anyway, the step b) is to be performed under conditions which do not cause water activity in the product to rise beyond the value of 0.5 (value determined at 25°C).

Preferably, according to the present invention, ethyl alcohol will be employed.

In the next step b1), in which, as already mentioned above, a water/alcohol mixture plus a thickening agent or just alcohol plus a thickening agent can be employed, again taking care of not surpassing the water activity value of 0.4-0.5, preferably maltodextrin or a glucose syrup are employed as thickening agents.

In that case, the ratio of the water-alcohol-maltodextrin solution will preferably be of 1-1-1.6.

In that case also, step b1), ethyl alcohol is preferably employed.

The packaging step is carried out preferably employing plastic materials of the composite type, containing a layer of EVOH or of PVDC or of A1.

Moreover, compressed foodstuffs obtained by means of the process disclosed above and in particular the products based on starting products of animal and/or vegetal origin, just freeze-dried or dried are also considered as belonging in the priority rights of this invention, as well as mixtures of products that are just freeze-dried or just dried, or of freeze-dried and dried products, to which mixtures a powder seasoning can be added as such or in the dried form.

Some examples of the process according to this invention will be reported in the following just for exemplification and not for limitative purposes.

EXAMPLE I

50 g of freeze-dried green beans having 3 % dampness, are sprayed with 3-4 g of a water/alcohol 1/3 nebulized solution and kept in a closed chamber for ten minutes.

Next the product so treated is sprayed with 2.5 g of a nebulized water-alcohol-maltodextrin solution in the respective proportions of 1+1+1.6 for 2-10 seconds.

The product is then transferred into a steel cell having a square base of 80 x 80 mm and a height of 200 mm, wherein the product itself is compressed by a piston which is driven by an oleodynamic unit, at a pressure of 10-12 kg/cm². The product is kept under load for 2-4 seconds from the time of maximum compression. Finally, by setting the cell bottom free, the "compressed" product is taken out of the cup by means of the piston itself.

The "compressed" product is finally packaged with materials having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PET-A1-PE or in the form of a thermoformed co-extruded material of PVC-PVDC-PE. The packaging is performed under a controlled N₂ atmosphere.

EXAMPLE II

50 g of freeze-dried spinach having about 4 % dampness are kept at a temperature of 80°C in a closed chamber for 10 minutes.

The product is then transferred into a steel cell having a square base of 80 x 80 mm and a height of 200 mm, wherein the product itself is compressed by a piston which is driven by an oleodynamic unit, at a pressure of 10-12 kg/cm². The product is kept under load for 2-4 seconds from the time of maximum compression.

Finally, on setting the cell bottom free, the compressed material is extracted from the cell by means of the piston itself.

The compressed material is finally packaged with material having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PET-A1-PE, or of a thermoformed co-extruded material of PVC-PVDC-PE. The packaging operation is carried out under a controlled N₂ atmosphere.

EXAMPLE III

100 g of dried carrots with about 4 % dampness are sprayed with 4-5 g of a water-alcohol-maltodextrin nebulized solution in the respective proportions of 1-1-1.6 for 2-10 seconds.

5 The product is then transferred in a steel cell having a square base of 80 x 80 mm and height 200 mm, and is compressed by means of a piston driven by an oleodynamic unit at a pressure of 45-50 kg/cm². The product is kept under load for 4-6 seconds from the time of maximum compression. Finally, on setting the cell bottom free, the "compressed" product is taken out of the cell by the action of the piston itself.

10 The "compressed" product is packaged with materials having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PET-A1-PE or of a thermoformed co-extruded material made up of PVC-PVDC-PE. The packaging is carried out under a controlled N₂ atmosphere.

EXAMPLE IV

15	Freeze-dried beets	23.3 g
	potato dice)	
	carrot dice)	
	onion slices)	105.7 g
20	celery dice)	
	precooked beans)	

23.3 g of freeze-dried beets having about 3 % dampness are sprayed with 1.4-1.8 g of a 1/3 water/alcohol nebulized solution and kept in a closed chamber for 10 minutes.

The product so treated is mixed with 105.7 g of dried products respectively in the proportions shown in the formulation and with 4 % max dampness.

The mixture so obtained is contacted with 4.3 g of a 1+1+1.6 water/alcohol/maltodextrin nebulized solution.

30 The fresh mixture so prepared is transferred into a steel cell having a square base, 80 x 80 mm, and of 200 mm height, and said mixture is compressed by a piston driven by an oleodynamic unit at a pressure of 35-38 kg/cm². The product is kept under load for 2-4 seconds from the time of maximum compression. Finally, on setting the bottom cell free, the "compressed" product is taken out of the cell by means of the piston itself.

35 The fresh mixture is packaged with materials having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PVC-EVOH-PE or of a thermoformed co-extruded material made up of PVC-PVDC-PE. The packaging operation is carried out under a controlled N₂ atmosphere.

After this treatment, the product shows a water activity less than or equal to 0.4.

EXAMPLE V

40 The process is carried out employing the same amounts and the same steps as those employed in the process for example IV.

Before the packaging step, 204.3 g of a seasoning mixture are added to the compressed material, said seasoning being based on vegetal and/or animal and/or mineral origin powders whose water activities were less than or equal to 0.3.

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EXAMPLE VI

95.5 g of dried carrots-onions-celery having 4 % maximum dampness are sprayed in the proportion corresponding to the formulation set forth above with 4.5 g of a nebulized 1+1+1.6 water-alcohol-maltodextrin solution for 2-10 seconds.

50 The mixture so prepared is transferred into a steel cell having a square base of 80 x 80 mm and a height of 200 mm, and said mixture is compressed by a piston driven by an oleodynamic unit under a pressure of 45-50 kg/cm².

55 The product is kept under load for 8-10 seconds from the time of maximum compression. Finally, on setting the cell bottom free the compressed material is taken out of the cell by the action of the piston itself.

The compressed material is packaged with materials having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PET-A1-PE or of the thermoformed co-extruded material made up of PVC-PVDC-PE. The packaging operation is carried out under a controlled N₂ atmosphere.

EXAMPLE VII

The process is carried out as disclosed in example VI, with the only difference that before the packaging step an amount of a seasoning mixture is added to the compressed material, said mixture being based on dried
5 vegetal and/or animal and/or mineral origin products whose amount is about equal to the amount of the starting product, the water activity being less than or equal to 0.3.

EXAMPLE VIII

10 23 g of freeze-dried green beans and 9 g of freeze-dried peas having 3 % maximum dampness are sprayed with 2.3 g of a nebulized water/alcohol 1+3 solution and kept in a closed chamber for 10 minutes.

Next they are mixed with 59 g of dried potatoes and with 9 g of dried carrots having 4 % maximum dampness. The resulting mixture is sprayed with 4 g of a 1+1+1.6 nebulized water/alcohol/maltodextrin solution.

15 The mixture so prepared is transferred into a steel cell having a square base of 80 x 80 mm and of 200 mm height, and it is compressed by means of a piston driven by an oleodynamic unit at a pressure of 18-20 kg/cm².

The product is kept under load for 4-8 seconds from the time of maximum compression.

Finally, by setting the cell bottom free, the compressed material is taken out of the cell by means of the piston itself.

20 The product is then packaged with materials having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PET-A1-PE or as a thermoformed co-extruded material of PVC-PVDC-PE. The packaging operation is carried out under a controlled N₂ atmosphere.

EXAMPLE IX

25 The process is carried out as disclosed in example VIII, with the only exception that, before the packaging step, an amount of a seasoning mixture is added to the compressed material, said seasoning being based on dried vegetal and/or animal and/or mineral origin products, the amount being about equal to that of the starting product, with a water activity not higher than 0.3.

EXAMPLE X

60 g of a mixture of equal portions of spinach, green beans and cauliflowers is sprayed with 4-5 g of a nebulized 1/3 water/alcohol solution and kept in a closed chamber for ten minutes.

35 The mixture so obtained is sprayed with 3-4 g of a nebulized 1+1+1.6 water/alcohol/maltodextrin solution for 2-10 seconds.

The mixture so prepared is transferred into a steel cell having a square base of 80 x 80 mm and of 200 mm height and is then compressed by a piston driven by an oleodynamic unit at a pressure of 10-15 kg/cm². The product is kept under load for 2-4 seconds from the time of maximum compression. Finally, by setting the
40 cell bottom free, the "compressed" product is taken out of the cell by the action of said piston itself.

The compressed material is packaged with a material having a high oxygen and water vapor barrier, in the form of a triple composite material made up of PVC-EVOH-PE or with a thermoformed co-extruded material made up of PVC-PVDC-PE. The packaging operation is performed under a controlled N₂ atmosphere.

EXAMPLE XI

45 The process is carried as disclosed in example X with the only exception that before the packaging step, an amount of a seasoning mixture is added to the compressed material, said mixture being based on dried vegetal and/or animal and/or mineral origin products, said amount being about equal to the amount of the starting
50 product, with a water activity lower than 0.3.

EXAMPLE XII

80 g of freeze-dried meat dice with about 3 % dampness is sprayed with 6-8 g of a nebulized 1/3
55 water/alcohol solution and kept in a closed chamber for 10 minutes.

The product so plasticized is sprayed with 3-4 g of a 1+1+1.6 water/alcohol/maltodextrin solution for 2-10 seconds.

The product so treated is transferred into a steel cell having a square base of 80 x 80 mm and of 200 mm

height and is then compressed by a piston driven by anoleodynamic unit at a pressure of 35-40 kg/cm².

The product is kept under load for 6-8 seconds from the time of maximum compression.

Finally, by setting the cell bottom free, the compressed product is taken out of the cell by the action of the piston itself.

5 The product is packaged with materials showing a high oxygen and water vapor barrier, in the form of a triple composite material made up of PET-A1-PE or of a thermoformed co-extruded material of PVC-PVDC-PE. The packaging operation is performed under a controlled N₂ atmosphere.

This invention has been disclosed just for illustrative purposes according to some preferred embodiments of the same, but it is to be understood that modification and/or changes can be introduced by those who are skilled in the art without departing from the spirit and scope of the invention for which a priority right is claimed.

Claims

- 15 1. A process for the production of compressed dehydrated foodstuffs starting from freeze-dried and/or dried vegetal and/or animal origin products, said process being characterized in that it comprises the steps of:
 - a) metering the freeze-dried and/or dried vegetal and/or animal origin products at the doses required for obtaining the final product desired;
 - 20 b) plasticizing the starting products by means of a water/alcohol solution or by means of just alcohol and/or keeping them at a temperature between 20°C and 95°C for a time in the range from 1 second to 10 minutes, till obtaining the desired plasticity;
 - c) compressing the product(s) at a pressure between 2 and 100 kg/cm², at a temperature between 20°C and 95°C for a time between 1 and 10 seconds; and
 - 25 d) packaging the product so obtained employing a high-barrier material; the final product being required to have a water activity value (WA) less than or equal to 0.4-0.5.
2. A process according to claim 1, characterized in that the following step b1) is performed just after step b):
 - 30 b1) adding a foodstuff-type thickening compound, dissolved in a water/alcohol solution or just in alcohol, in such an amount that the weight of the solution represents a weight percentage between 1 and 6 % of the finished product.
3. A process according to claim 2, characterized in that in the case of freeze-dried and dried vegetal and/or animal products, the plasticizing step b) is carried out only on the freeze-dried products, whereas the dried products are conveyed directly to the step b1) in which the thickening agent is added, during which step
 - 35 they are mixed with some of the freeze-dried products coming from the step b) that, due to their own nature, require a thickening agent for becoming amalgamated.
4. A process according to anyone of the preceding claims, characterized in that during the packaging step d), in the case of mixtures of freeze-dried and/or dried products, the seasoning powders are added as such
 - 40 and/or in the form of dried powders, but anyway with a water activity less than or equal to 0.3.
5. A process according to anyone of the preceding claims, characterized in that the dampening step b) is carried out through nebulization.
- 45 6. A process according to anyone of the preceding claims, characterized in that the dampening step b) is carried out employing a water/alcohol mixture in proportions variable between 1 % water-99 % alcohol and 99 % water-1 % alcohol.
7. A process according to claim 6, characterized in that the step b) is carried out employing a solution comprising 20-30 % water and 70-80 % alcohol.
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8. A process according to anyone of the preceding claims, characterized in that said step b) is performed employing just ethyl alcohol or a water solution of the same.
- 55 9. A process according to anyone of the preceding claims 1-4, characterized in that step b) is performed by keeping the products at a temperature between 20°C and 95°C for a time between 1 second and 10 minutes.

10. A process according to anyone of the preceding claims 2-9, characterized in that maltodextrin is employed as a thickening agent in said step b1).
- 5 11. A process according to claim 10, characterized in that said step b1) is performed employing a 1/1/1.6 water/alcohol/maltodextrin solution.
12. A process according to anyone of the preceding claims 2-9, characterized in that a glucose syrup is employed as the thickening agent in said step b1).
- 10 13. A process according to anyone of the preceding claims 2-12, characterized in that ethyl alcohol is employed, as such or as a water solution in addition to the thickening agent in said step b1).
14. A process according to anyone of the preceding claims, characterized in that the packaging step d) is carried out employing composite plastic materials containing an EVOH or a PVDC or an aluminium layer.
- 15 15. Compressed dehydrated foodstuffs obtained according to the process of anyone of the preceding claims, said foodstuffs being based on freeze-dried and/or dried animal and/or vegetal origin products as single products or as a mixture.
- 20 16. Foodstuffs according to claim 15, characterized in that a powder seasoning is added as such and/or as a dried powder to said mixtures, but not to surpass a water activity value of 0.3.

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European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0240

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X, D	US-A-3 385 715 (N.H. ISHLER) * claims 1,2,4,14 * * column 10, line 33 - line 54 * ---	1, 5, 6, 8, 15	A23P1/10 A23L3/44 A23L3/42
X, D	US-A-3 806 610 (A.R. RAHMAN) * claim 1 * * column 1, line 53 - column 2, line 52 * ---	1, 9, 15	
A	FOOD TECHNOLOGY, vol. 31, no. 4, April 1977, CHICAGO US pages 58 - 64; M.GEE, D.FARKAS, A.R. RAHMAN: 'Some Concepts for the Development of Intermediate Moisture Foods' * table 2 * * page 64, left column, paragraph 2 - right column, paragraph 2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A23P A23L A23B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 DECEMBER 1991	Examiner VUILLAMY V.M. L.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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